FUTV-8333 DVB-T Digital Transmitter

User's Manual

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Alert & Disclaimer

Dear User,

Thanks for your choice of our FMUSER FUTV-8333 DVB-T Digital Transmitter.

Please read this manual carefully before you install and operate the devices. FMUSER shall have no liability for any error or damage resulting from any breach or neglect of the manual.

Please properly keep this manual for the future reference.

About This Manual

Intended Audience

This user manual has been written to help people who have to use, to integrate and to install the product. Some chapters require some prerequisite knowledge in electronics and especially in broadcast technologies and standards.

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DVB-T Transmitter

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Chapter 1 Introduction

1.1 Outline

FUTV-8333 is a professional DVB-T digital transmitter newly developed by FMUSER, which gives medium (600W) and sustained power output. Its compact structure design has greatly saved space for your room. It supports SFN and MFN network mode, output with both signal carrier mode and multi carrier mode, and supports signal channel and broadband transmission.

The frequency range of FUTV-8333 is from 470MHz～566MHz, 6060MHz～806MHz. This transmitter has a very high linear and high reliability as it takes high gain and high linear LDMOS tube amplifier module. Furthermore, it supports AGC function to keep sustained power output.

FUTV-8333 600W DVB-T digital transmitter can be widely used in HD/SD digital TV signal transmitting and broadcasting system.

1.2 Key Features

- Ø Enhanced signal transmission quality
- Ø Intelligent and modularized amplifier unit, takes high power gain and high linear LDMOS tube amplifier module design
- Ø Low power consumption and super linear design to improve the transmission power, and reduce the nonlinear distortion
- Ø Support AGC function with sustained power output to allow the transmitter a good stability and reliability

- Ø Support MFN and SFN system
- Ø Have the fault diagnosis function
- Ø Full digital front panel control, easy operation.
- Ø LED on the front panel support alarm and signal monitor
- Ø Stabilized-power supply with wide range of voltage and high efficiency
- Ø Amplifier and switching power supply one-for-one configuration, connect directly to each other, reducing wired loss
- Ø Cooling system with low consumption and low noise
- Ø Multi lightning protection measures, good protection for whole equipment.
- Ø 24-hour working unmanned, user friendly design
- Ø Easy to install, elegant appearance

1.3 Technical Specifications

Basic Parameters	System standard	DVB-T/DVB-C/MPEG-2
	Modulation Mode	QAM4/16/32/64
	Frequency Range	470MHz~806MHz
	output rating	600W
	Output characteristic impedance	50Ω
	variation of output power	±0.25dB
	In-band stray	≤-60dBc
	Out-of-band suppression	≥65dBc
Input	frequency	470MHz~806MHz

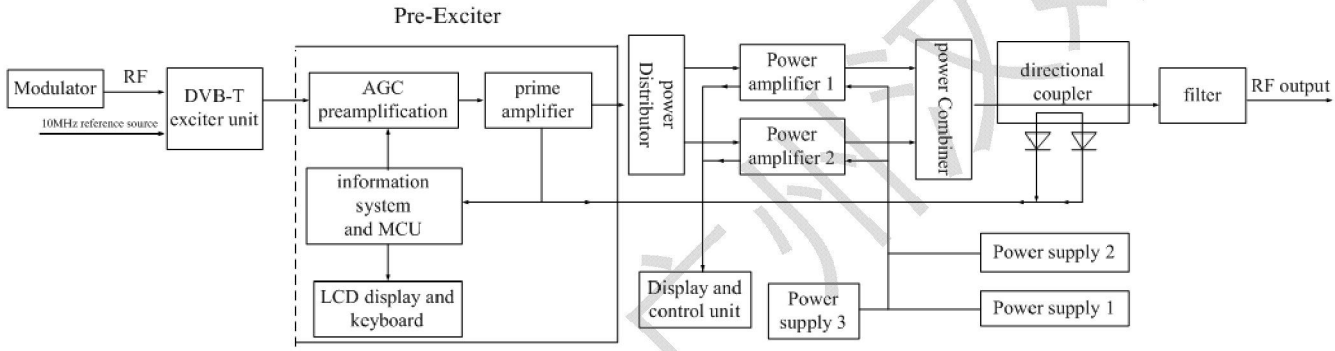
	Input Level	-20 dBm±3dB
	Input reflection loss	≥15dB
	Input Interface	'N'
Output	RF output power	600W
	Output frequency	470MHz~806MHz
	Output impedance	50Ω
	frequency response	±0.75dB
	Shoulder level	≥36dB@central freqnencyIF±4.2MHz
	output reflection loss	≥20dB
	Output interface	1-5/8 EIA
Environment condition	Working temperature	-20~+50℃
	Storage temperature	-30~+75℃
	Relatively humidity	＜95%（25℃ no condensation
	Cooling mode	inside cooling fan
	atm press	86~106kPa
	power supply	AC，220V±10%/50Hz
	Machine room requirement	less dust，no shake
	Working temperature	-20~+50℃

Optical signal parameter

parameters	**unit**	**Technical index**
Optical wavelength	nm	1100-1600

norminal optical input power	dBm	-1
Input optical power range	dBm	-7~+3
Max input optical power	dBm	+3
Optical interface		FC/APC
optical reflection loss	dB	≥45
output reflection loss	dB	≥12
inband flatness	dB	≤±0.5

1.4 System Principle



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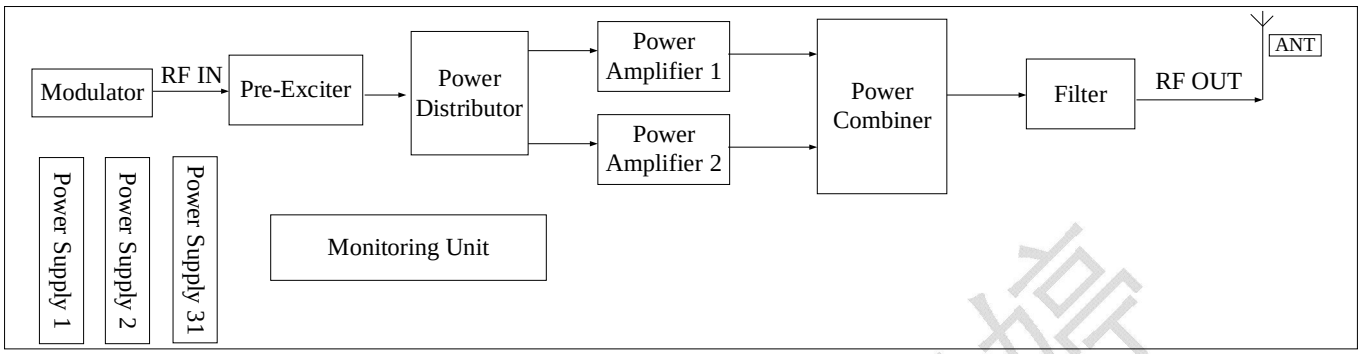
1.5 Constituent Devices and Function Description

The whole working system is composed of:



Items	Quantity
Power Supply	3 PCS
Modulator	1 PC
Pre-Exciter	1 PC
Power Distributor	1 PC
Power Amplifier	2 PCS
Power Combiner	1 PC
Filter	1 PC
Antenna	1 PC
Monitoring Unit	1 PC

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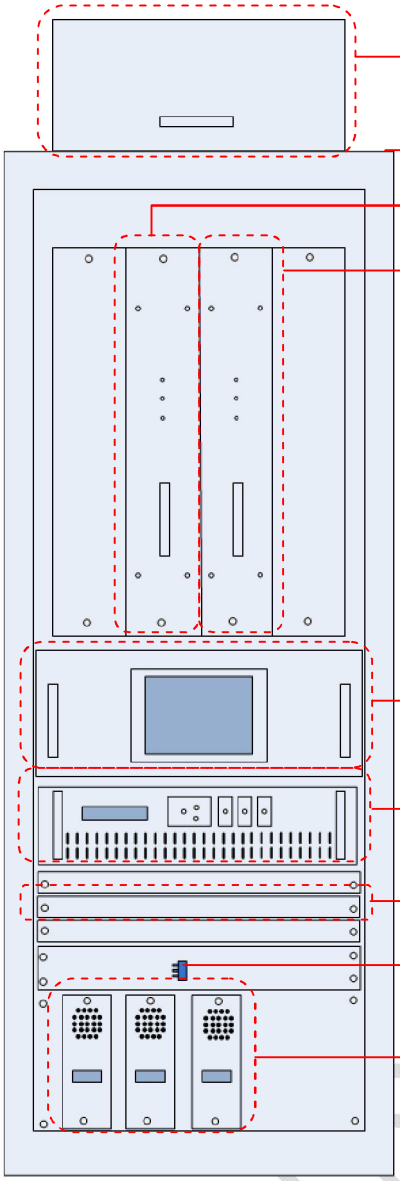

Face Side

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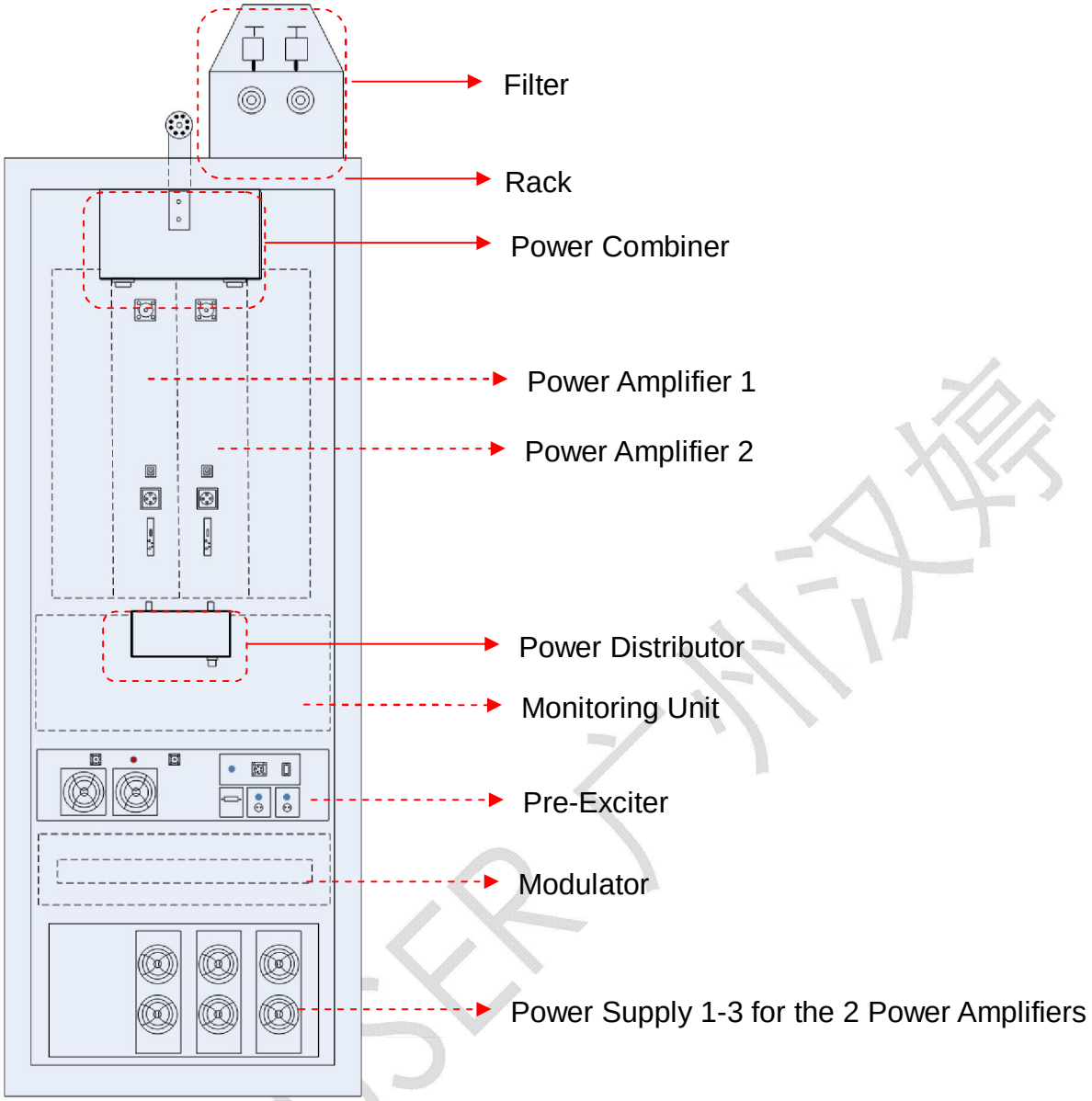
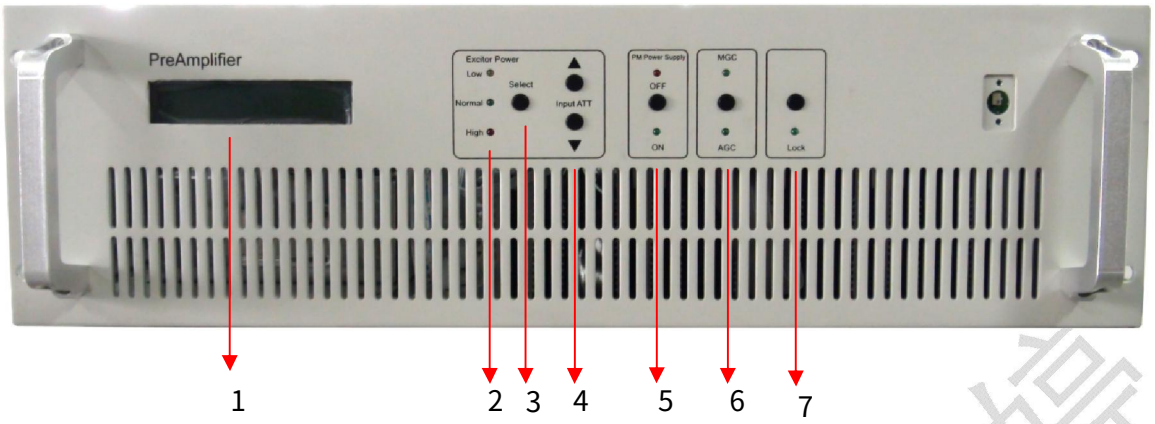


Back Side

Back Side of the Constituent Device

1.5.1 Pre-Exciter front panel



Serial No.	Item
1	LCD Window
2	Indicators of signal strength output from the exciter
3	Button of LCD-page turning
4	Buttons of adjusting the strength of input signals
5	Control button & indicators of the power supply of the final amplifier
6	Control button & indicators of working mode (AGC/MGC)
7	button to lock the key board & indicators

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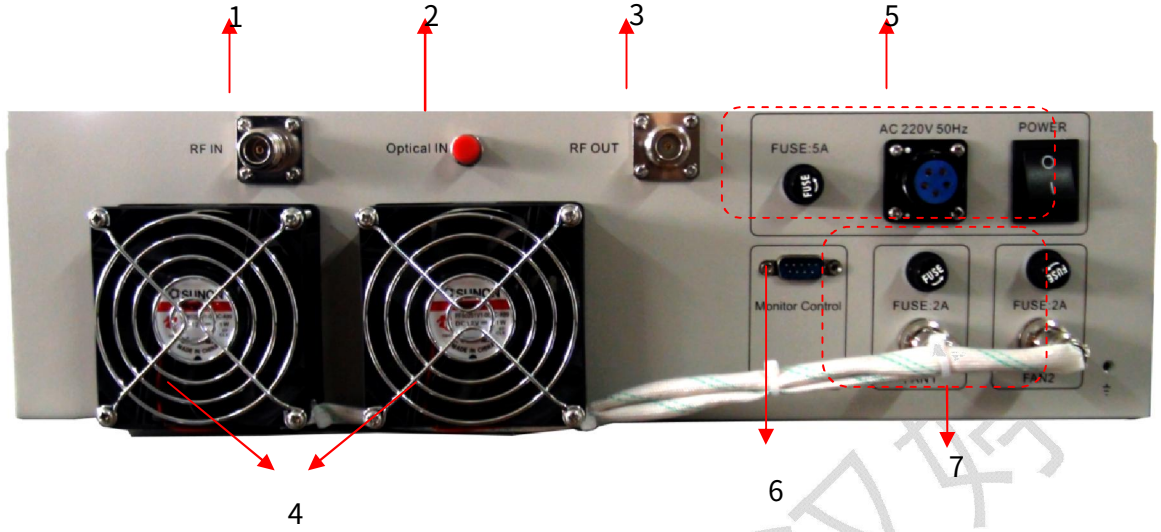
1.5.2 Pre-Exciter back panel



Serial No.	Item
1	RF Input port
2	Optical Input
3	RF Output port
4	Cooling fans
5	Fuse/power supply socket/ switch for the pre-exciter
6	Monitoring port
7	power supply/fuse for the fans

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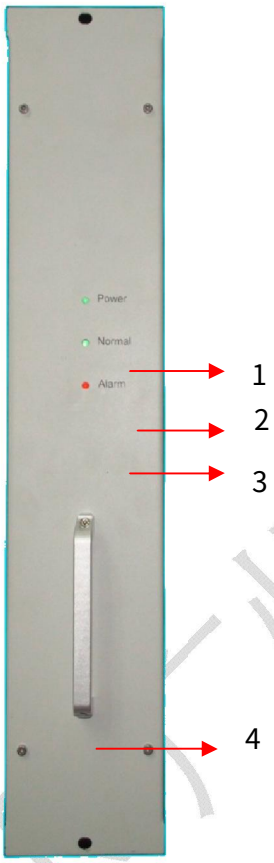
1.5.3 Power Amplifier front panel



Serial No.	Item
1	Power indicator
2	Amplifier working status (normal) indicator
3	Amplifier alarm indicator
4	Handle

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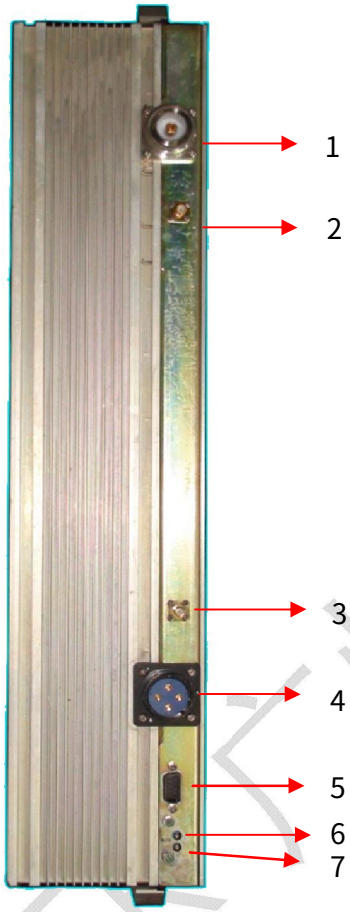
1.5.4 Power Amplifier back panel



Serial No.	Item
1	RF Output port
2	RF Test Port
3	RF Input port
4	DC Power Input Socket
5	Monitoring Port
6	Reflect-power Detection Pin
7	Output-power Detection Pin

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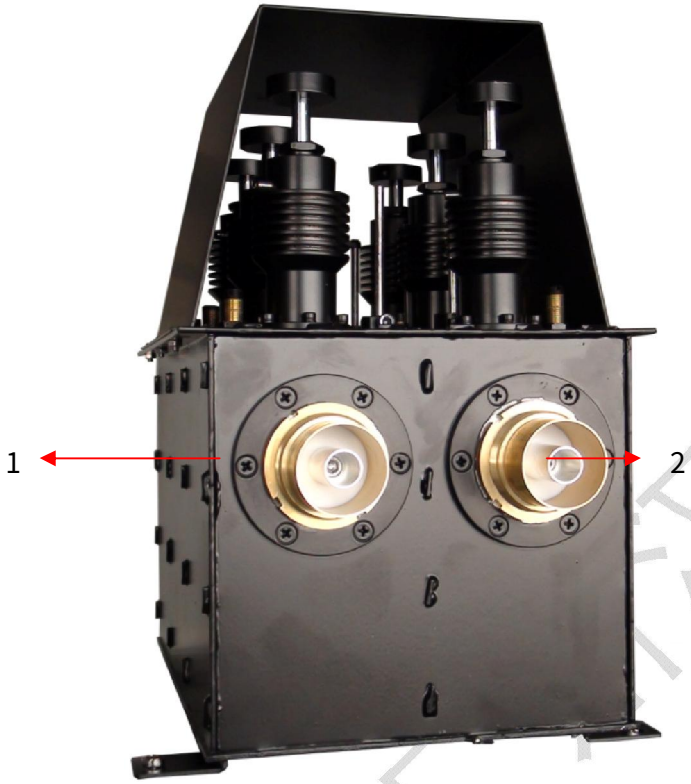
1.5.5 Filter



Serial No.	Item
1	RF Input Port (connect to power combiner)
2	RF Output Port (connect to antenna)

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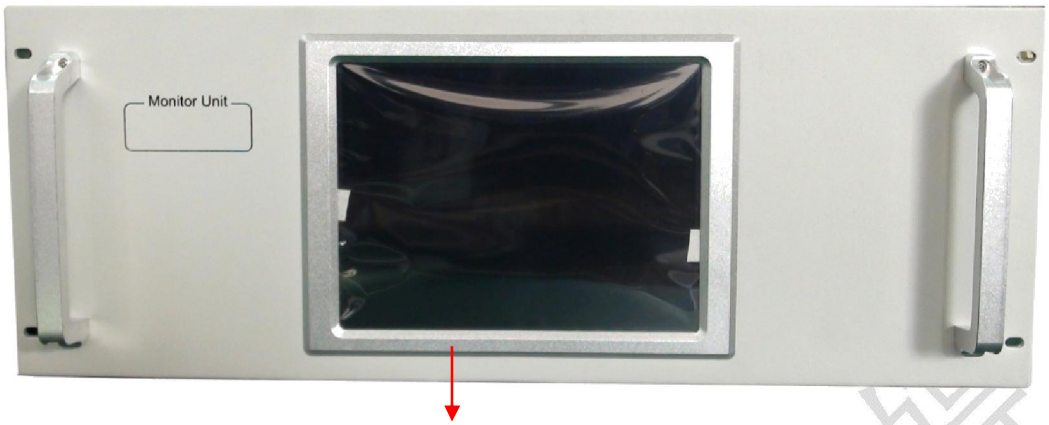
1.5.6 Monitor Unit Front Panel



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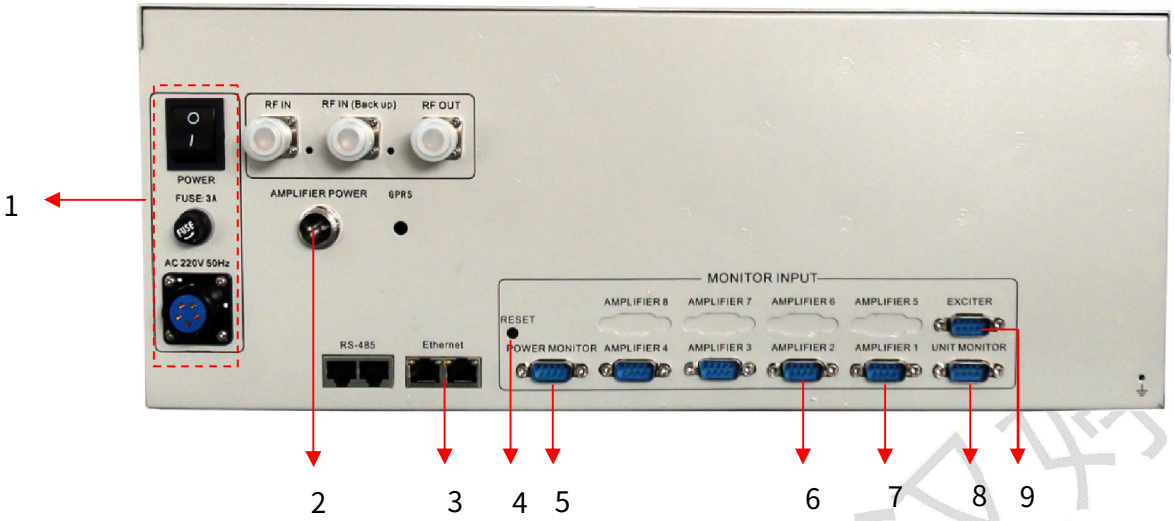
1.5.7 Monitor Unit Back Panel



Serial No.	Item
1	Power switch/fuse/socket
2	Amplifier Power Supply interface (to protect the power supply if the output power overload)
3	Ethernet Ports
4	Reset Button
5&6	Power Monitoring input port
7	Amplifiers 1&2 Monitoring input port
8	Power Combiner Monitoring input port (to monitor the whole unit)
9	Per-Exciter Monitoring input port

Remarks: the rest interfaces are not put in use so far.

1.5.8 Power Supply (for power amplifiers) Front Panel

Serial No.	Item
1	LED display for output current/voltage
2	Power-protection indicator
3	Output voltage adjustment hole
4	I/V(current/voltage) shifter

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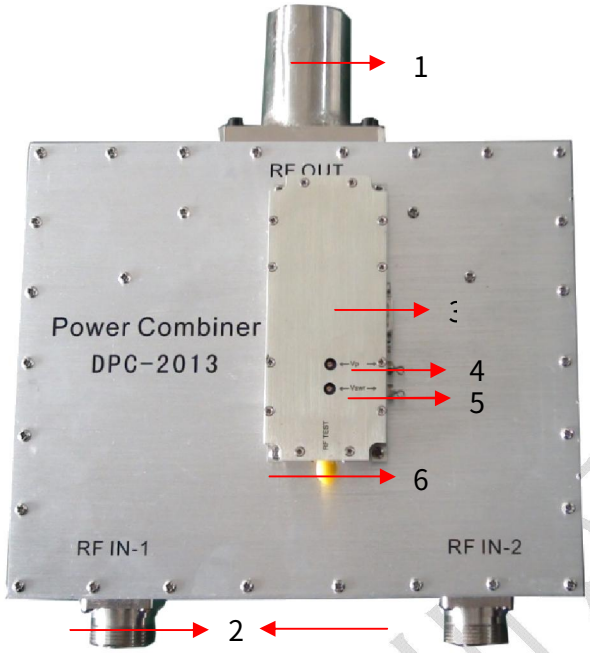
1.5.9 2-in-1 Power Combiner



Serial No.	Item
1	RF Output port
2	RF Input ports 1 & 2
3	Monitoring Port
4	Whole reflection power test pin
5	Whole power output test pin
6	Whole RF output monitoring port

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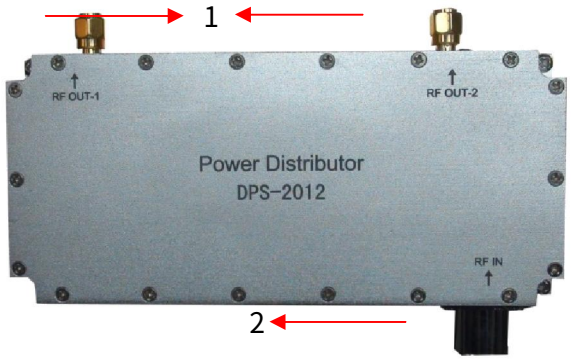
1.5.10 Power Distributor



Serial No.	Item
1	RF output port 1 & 2
2	RF Input port

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Chapter 2 Instruction of Installation and Operation

2.1 Unpacking and Acquisition Check

After a strict debugging, burn-in and testing, every constituent device (modulator, pre-exciter, power supply...) of this transmitter is packed separately in wooden boxes to facilitate the long-way transit.

Please unpack the boxes carefully and check the items according to the packing list attached. If any item missing, please contact the supplier immediately.

2.2 Installation Preparation

When users install device, please follow the below steps. The details of installation will be described at the rest part of this chapter.

- Check the possible device missing or damage during the transportation
- Prepare a relevant environment for installation
- Stand the rack
- Fix the positioning bolt to avoid slide or topple
- Read the user manual

  Read this manual carefully and follow the steps stated. Operators are required to have some prerequisite knowledge in electronics and especially in broadcast technologies and standards.

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2.2.1 Power Supply

The input voltage is required to be 220VAC, 50/60Hz. To ensure the safety of the device and operators, this transmitter adopts three-wire plug with one of the wires to connect to the ground. The specification of the ground wire shall comply with the local standard and regulation.

Voltage in the socket shall not overload. Cares should be taken when you use extending power-line or integrated plug seat in case possible risk of electric shock or fire.

2.2.2 Working Environments

The transmitter should been placed in a ventilated and dry place for working to avoid overheat, wet and dust. It is also required to keep far away from heart source to make sure the equipment can work well.

2.2.3 Lightning protection

To avoid the damage caused from thunder or mains fluctuation, please make sure to use transmitter in the place where have lightning arrester.

2.2.4 Ground connection

The ground connection side of this device should connect to copper bar of protected area. Make the ground wire as short as possible. If the ground wire is too long, just cut short to avoid the ground wire wind round together. The cross area of ground wire must $\geq 25\ mm^2$, and ground resistance must $\leq 4\Omega$.

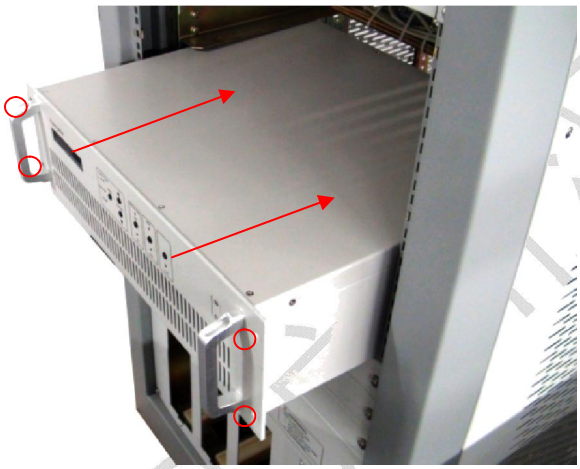
2.3 Installation and Operation

Please install and operate step by step as following:

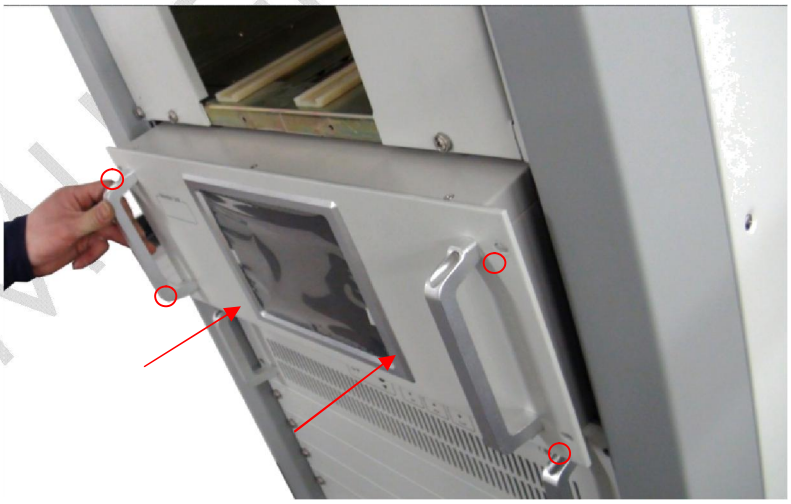
2.3.1 Stand the rack and fix the positioning bolt to avoid slide or topple

2.3.2 Install the each constituent device on the rack

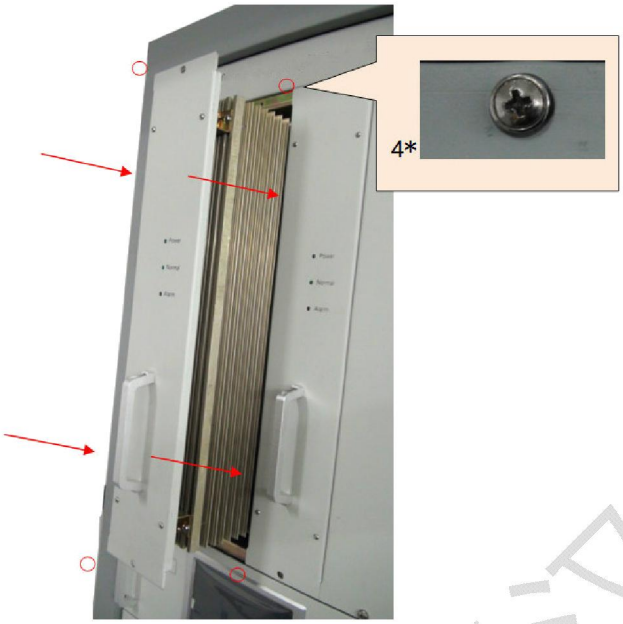
Push the 3 Power suppliers in the slots and fix them by screwing the two ends.



Push the Pre-Exciter in this slot and fix it by screwing the four corners.



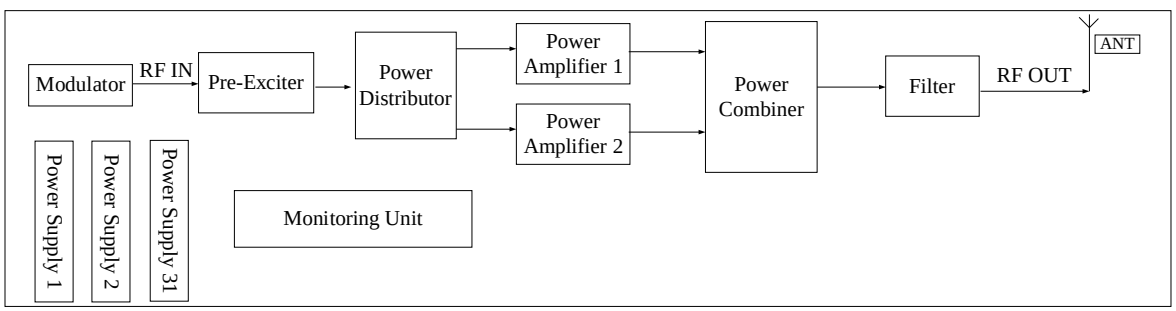
Push the Monitoring Unit in this slot and fix it by screwing the four corners.



Push the 2 power amplifiers in the slots and fix them by screwing the two ends

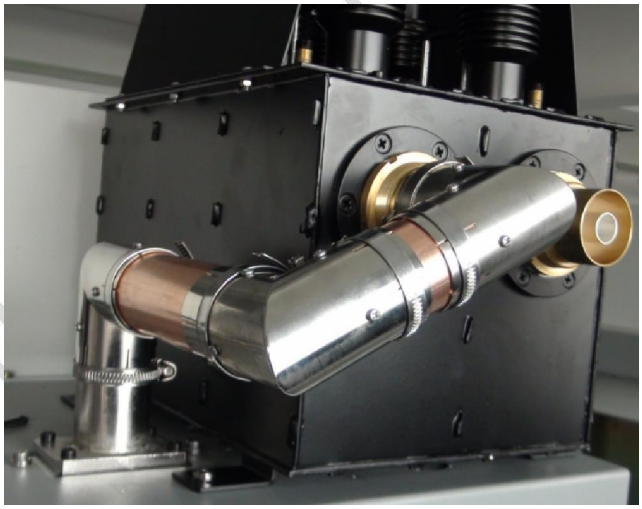
Place the filter on the top of the rack and fix it by screwing the four feet.

2.3.3 Connect the power wires & signal cables & monitoring cables

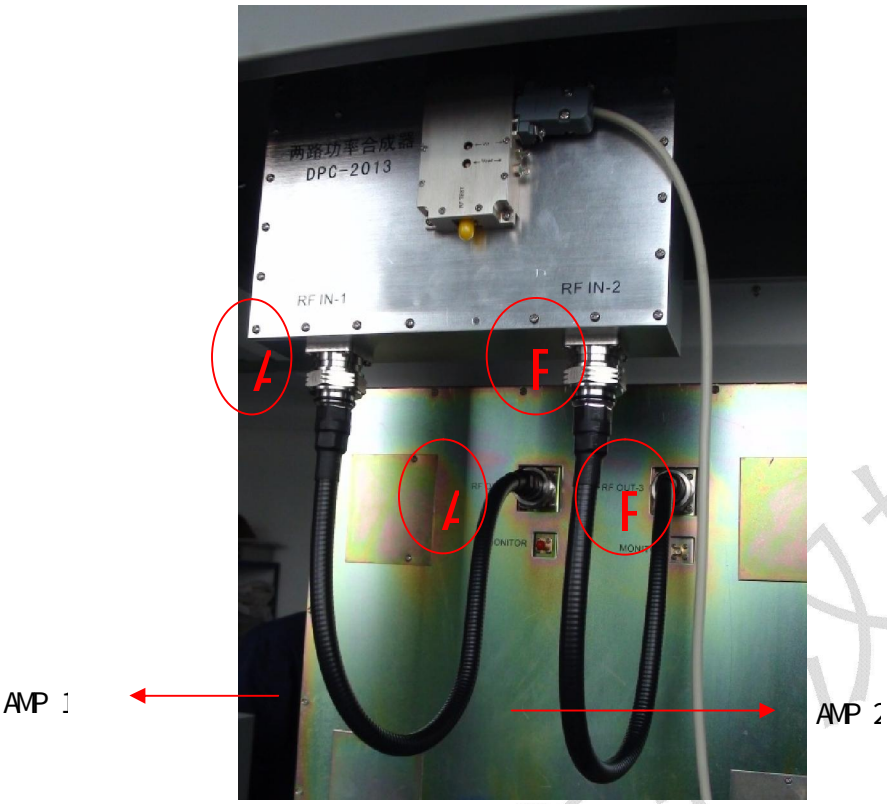


- Install the transmit antenna on to the transmit tower. (Antenna is extra equipment which we do not offer unless the customer requires to purchase.)
- Connect RF output interface of the filter to the input interface of antenna with a soft feeder.

The RF output interface in open circuit (disconnect antenna) may bring damage to transmitter



- Connect RF output interface of the combiner to the input interface of filter with a hard feeder

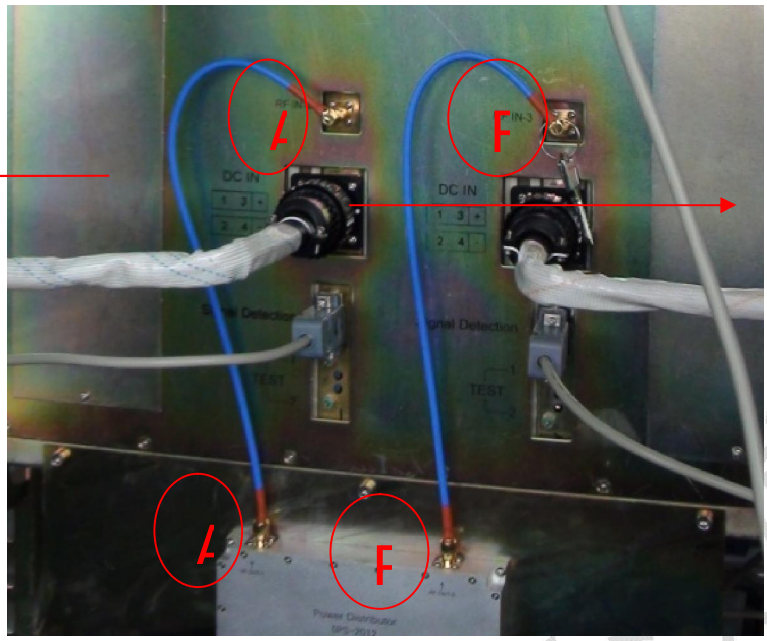


l Connect RF output interface of the amplifiers to the input interface of combiner with feeders (AMP 1 & AMP 2 shown above).

The two feeders are different and exclusive for each amplifier (**AMP 1 to connect port A; AMP 2 to connect port B**). Read the **labels** stuck onto the feeders and connect to the corresponding ports. No exchange is allowed

l Connect the monitoring port on the combiner to the Monitoring Unit.

AMP 1



AMP 2

- Connect RF output interface of the distributor to the input interface of amplifiers with cables (AMP 1 & AMP 2 shown above)

  The two cables are different and exclusive for each amplifier (**AMP 1 to connect port A; AMP 2 to connect port B**). Read the **labels** stuck onto the cables and connect to the corresponding ports. No exchange is allowed

- Connect the monitoring ports (signal detection ports) on the amplifiers to the Monitoring Unit. One end of the monitoring cable connect to amplifier 1 (2) and the other end to *"AMPLIFIER 1"* (*"AMPLIFIER 2"*) port on the Monitoring Unit. (shown as picture below)

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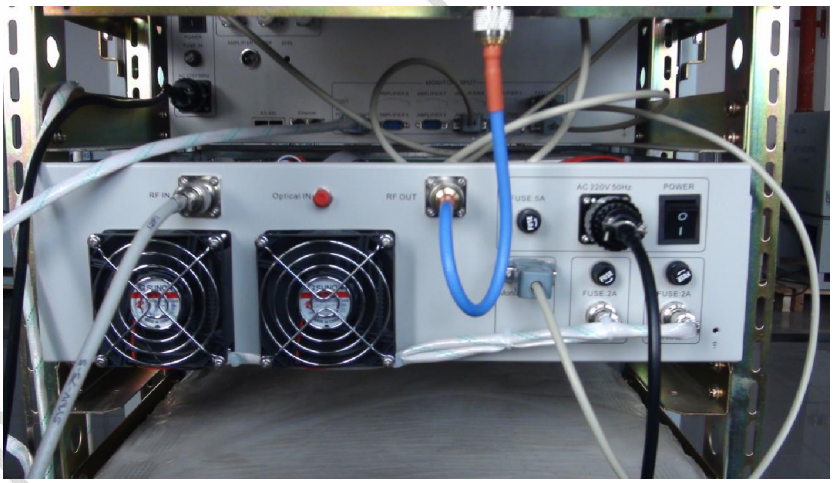
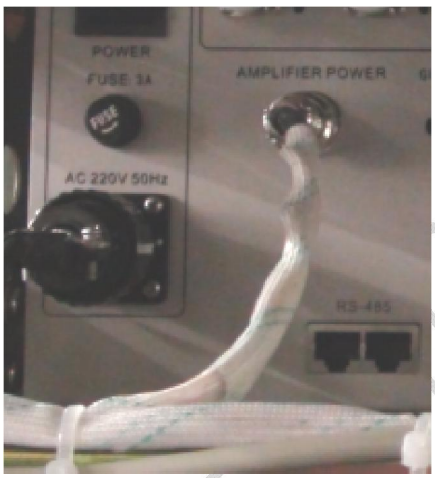
- Connect RF output interface of the pre-exciter to the input interface of distributor with cable. (shown above)



- Connect RF output interface of the modulator (or other signal source device from the users) to the input interface of pre-exciter with cable. (shown above, the left cable)

- Connect the monitoring port on the pre-exciter to the Monitoring Unit.

- **An overview of the cable connection of the Monitoring Unit (the 2 pictures below)**

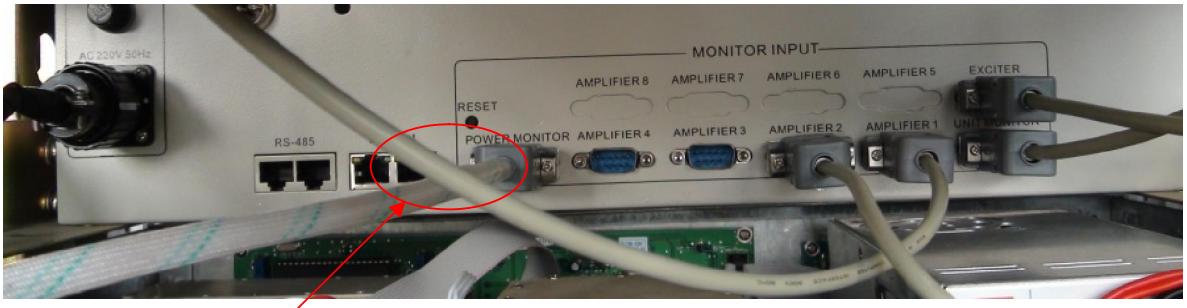


This cable connects the monitoring unit and the AMP power to protect the AMP power suppliers. The AMP power will be cut off automatically to protect itself from burn-out if any of following errors happens.

A) The working temperature of any of the two power amplifiers exceeds 65 ℃.

B) Output power overload: The whole output power exceeds 25% of the rated power. (>750W)

C) The whole reflect power reaches 25% of the rated power. (150W)

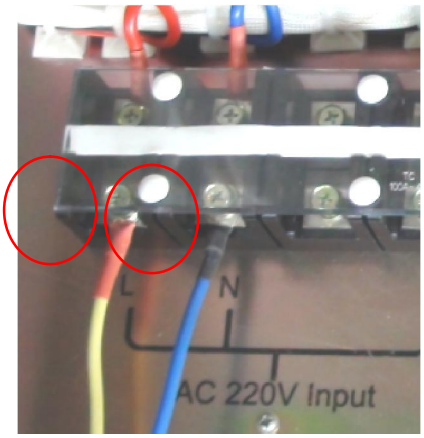


This monitoring interface (POWER MONITOR) is to monitor the power suppliers. It is connected to the power suppliers and offers information (Voltage) on the touch screen in the front panel.

2.3.4 Connect the ground pole (at the bottom of the rack) with earth lead.

2.3.5 Make sure the power switch is in OFF state and connect the power joint (at the bottom of the rack) of the transmitter to the room's power supply with the three-core line as shown in below picture. This is to offer power to the pre-exciter, ventilation casing, and monitoring unit.

Note: voltage must be AC 220V 50Hz and no cross of "L" pole and "N" pole. ("L": Live Wire; "N": Neutral Wire)

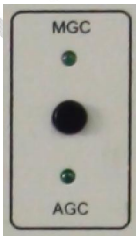


2.3.6 Turn on the power. After a second the transmitter starts to work

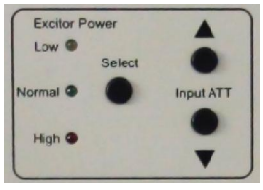
2.4 Digital RF Signal Debug

If the input signal is digital RF, users can debug and set the signal through pre-exciter as follows:

1. Connect the RF output port to antenna；
2. Connect the RF IN port to the signal source cable；
3. Turn on the main power switch；(The 3 steps have been completed in 2.3.)
4. Check whether the working state is normal from the pre-exciter's LCD window；
5. Set the working mode as MGC through the key board (MGC indicator lights up.)



6. Debug the output power according to power indicators.

	Indicator	Output power	Alarm	Solutions
	Yellow	too low	yes	Press SELECT key to turn LED to page "RF IN ATT" and press UP button to increase the ATT (attenuation).
	Green	Normal	no	N/A
	Red	too	yes	Press SELECT key to

		high		turn LED to page “RF IN ATT” and press DOWN button to decrease the ATT (attenuation).

NOTE:

- The key board can only be operated until it is unlocked by pressing the LOCK button.
- ATT value increases, while signal strength decreases.
- ATT value decreases, while signal strength increases
- Refer to 3.3 for more detailed operations

7. When the power indicator turns to green, which signifies the output power is normal, set the working mode as AGC through the key board. 40-60 seconds later, the transmitter starts working automatically.

2.5 Optical Signal Debug

If the input signal is optical, users can debug and set the signal through pre-exciter as follows:

1. Connect the RF output port to antenna；
2. Connect the Optical IN port to the signal source cable；
3. Turn on the main power switch；(The 3 steps have been completed in 2.3.)
4. Check whether the working state is normal from the pre-exciter’s LCD window
5. Set the working mode as MGC through the key board

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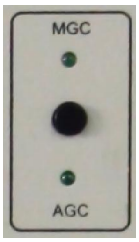
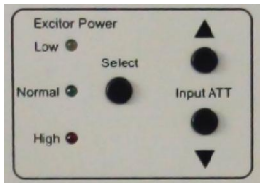


6. Debug the output power according to power indicators.

	Indicator	Output power	Alarm	Solutions
	Yellow	too low	yes	Press SELECT key to turn LED to page “RF IN ATT” and press UP button to increase the ATT (attenuation)
	Green	Normal	no	N/A
	Red	too high	yes	Press SELECT key to turn LED to page “RF IN ATT” and press UP button to decrease the ATT (attenuation)

NOTE:

- The key board can only be operated until it is unlocked by pressing the LOCK button.
- ATT value increases, while signal strength decreases.
- ATT value decreases, while signal strength increases
- Refer to 3.3 for more detailed operations

7. When the power indicator turns to green, which signifies the output power is

normal, set the working mode as AGC through the key board. 40-60 seconds later, the transmitter starts working automatically

REMARKS：Please advise the whether your signal source is digital RF or optical signal when you place an order.

Warnings:

1. **Open circuit output port is not allowed；**
2. **No inserting or drawing cables when the transmitter is working；**
3. **The transmitter is equipped with high-voltage components. Don’t remove the cover unless the security is ensured；**
4. **Please contact the authorized maintenance man if any breakdown occurs.**

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Chapter 3 Pre-Exciter Operation

3.1 Key Board Locking/Unlocking

Press LOCK key for 3 seconds to unlock the key board (the locking indicator goes out) to operate the pre-exciter. After finishing operation, please press LOCK key for 3 seconds to lock the key board (the locking indicator lights up) to avoid mis-operation.

3.2 LCD Operation

3.3.1 Interfaces of input-signal strength

RF IN ATT：0dB

RF IN ATT：15dB

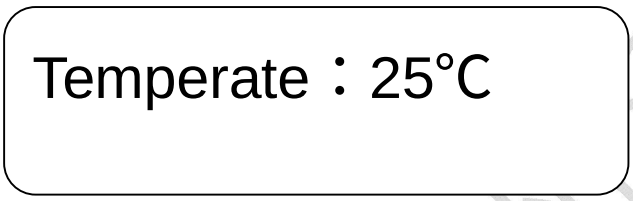
RF IN ATT：31dB

Above interfaces display the information about adjusting the input signal strength.

When you start debug the signal power, follow the steps as below:

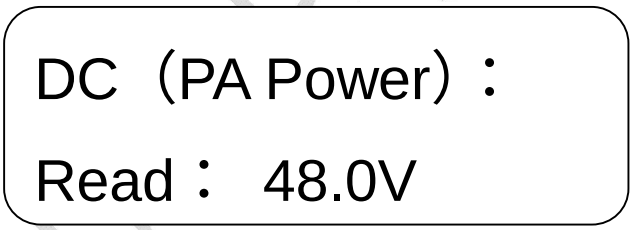
- Set the working mode as “MGC”
- Turn the LED to page “RF IN ATT” by pressing *SLECT*.
- Press “▲”or “▼” to modify the value (0～31dB) until it indicates the output power is normal (the green indicator lights up)
- Set the working mode as “AGC”

3.3.2 Temperature



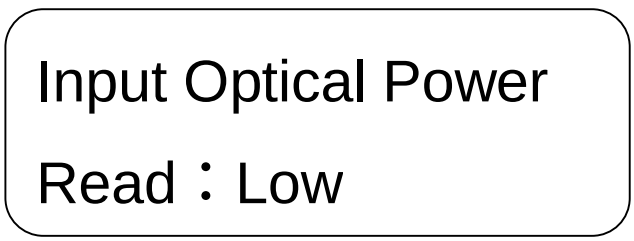
It displays the current environment temperature. Press *SELECT* to turn the LED to this page. It is the read-only and can’t be modified.

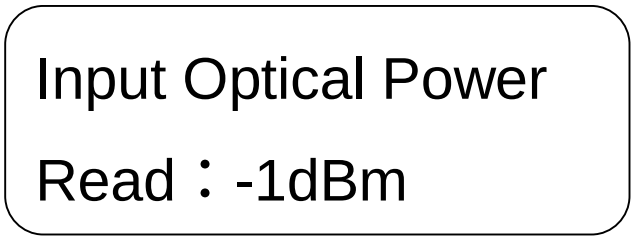
3.3.3 PA (Power Amplifier) Power

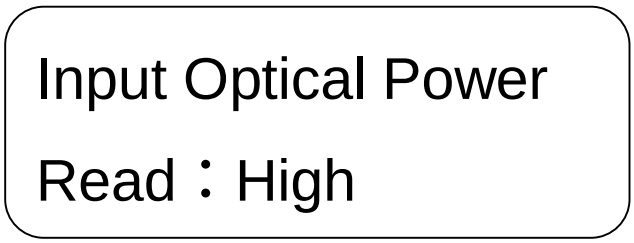


It displays the current power voltage of the power amplifiers. Press SELECT to turn the LED to this page. It is the read-only and can’t be modified.

3.3.4 Input Optical Signal Power



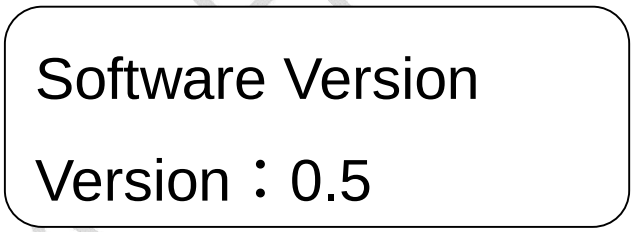




Above interfaces display the information of the input optical signal strength. It is read-only. When it displays LOW, it indicates the optical power is under -7dBm. Likely, -1dBm indicates the actual optical power (-7dBm～+3dBm), and HIGH indicates the optical power is over +3dBm.

REMARKS: -1dBm is the recommended optical power.

3.3.5 Software Version

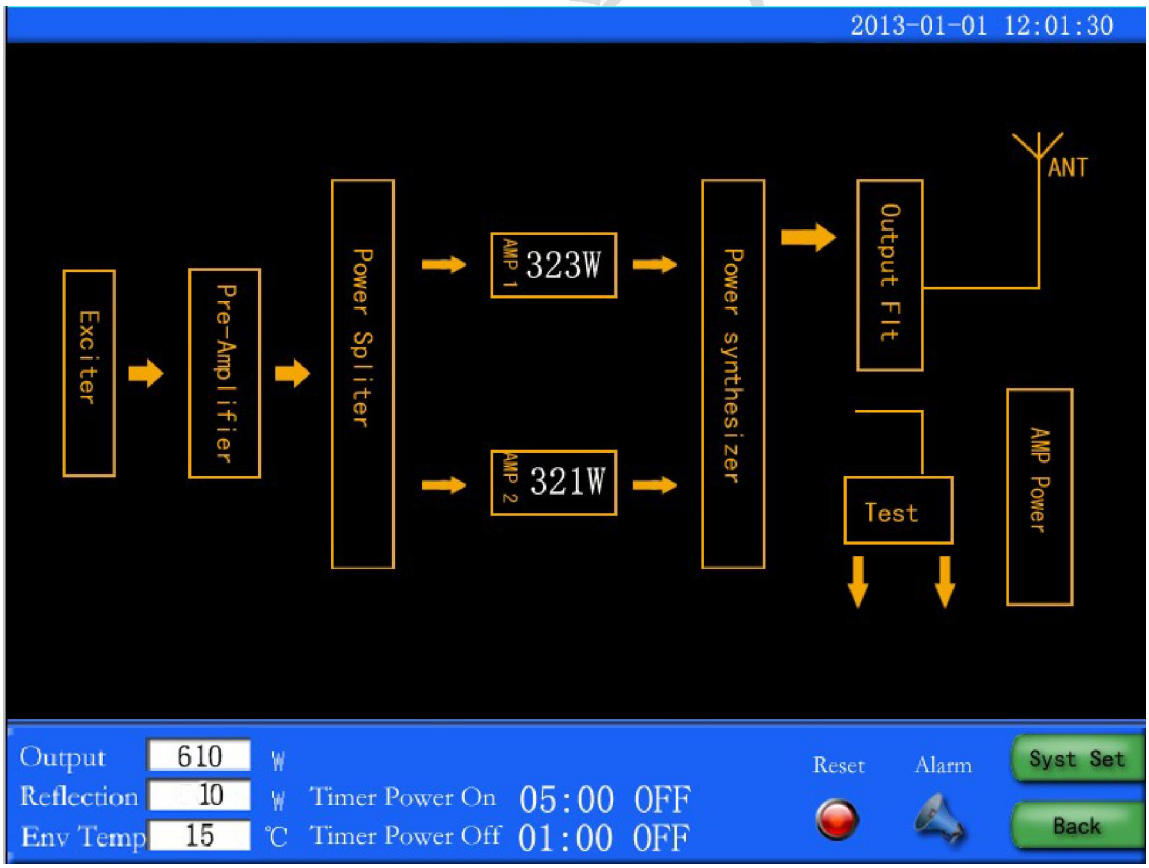


It displays the software version number of this device. Press *SELECT* to turn the LED to this page. It is the read-only and can't be modified.

Chapter 4 Monitoring Unit Operation

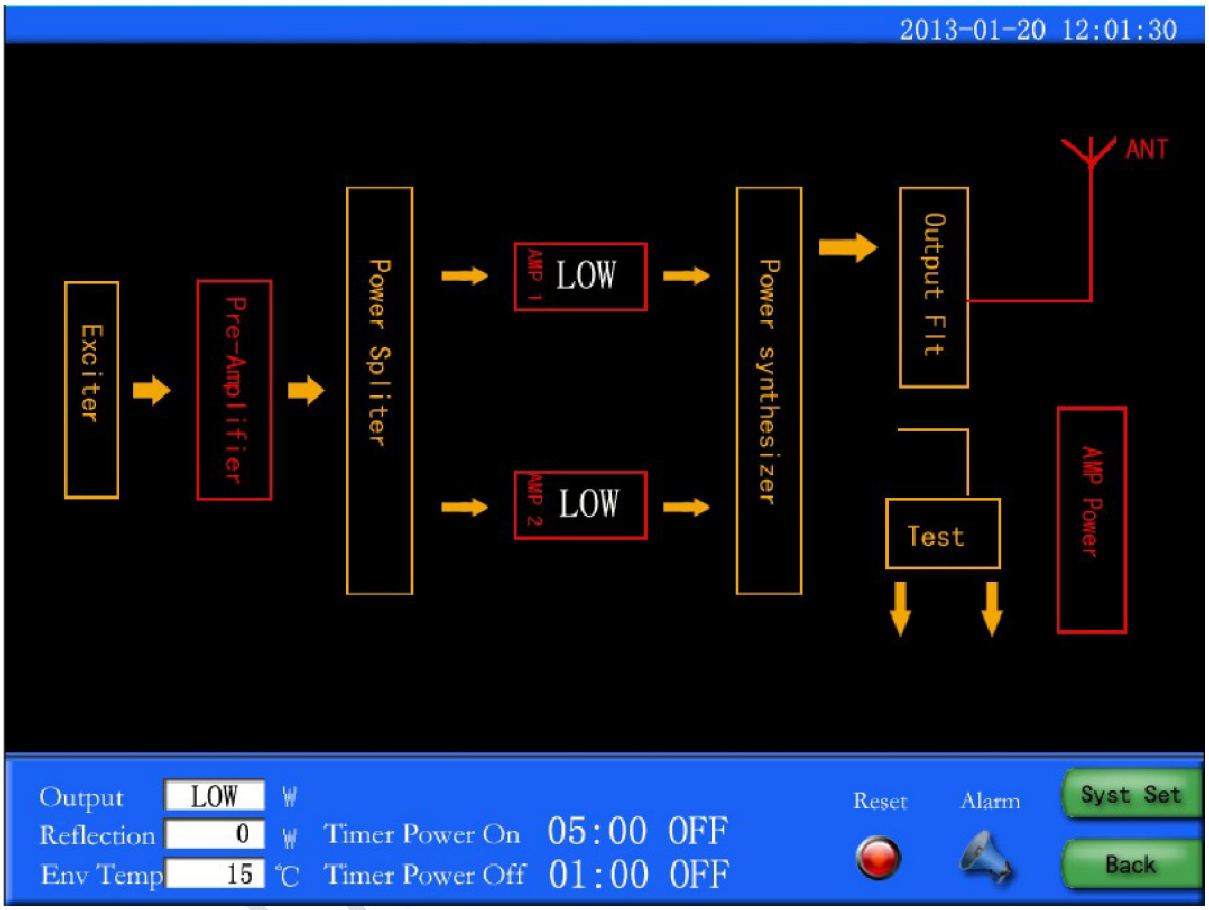
Monitoring unit can real-timely put a watch on electric current, voltage, power and etc and show these numbers on the touch screen. Users can enter the sub-interface to check the specified parameters (the parameters cannot be configured through this monitoring unit.).

Below picture shows the main monitoring overview of each constituent device (Pre-Exciter, containing exciter and Pre-Amplifier, Power splitter, 2 final amplifiers, filter, AMP power and antenna.) and the basic signal flow.



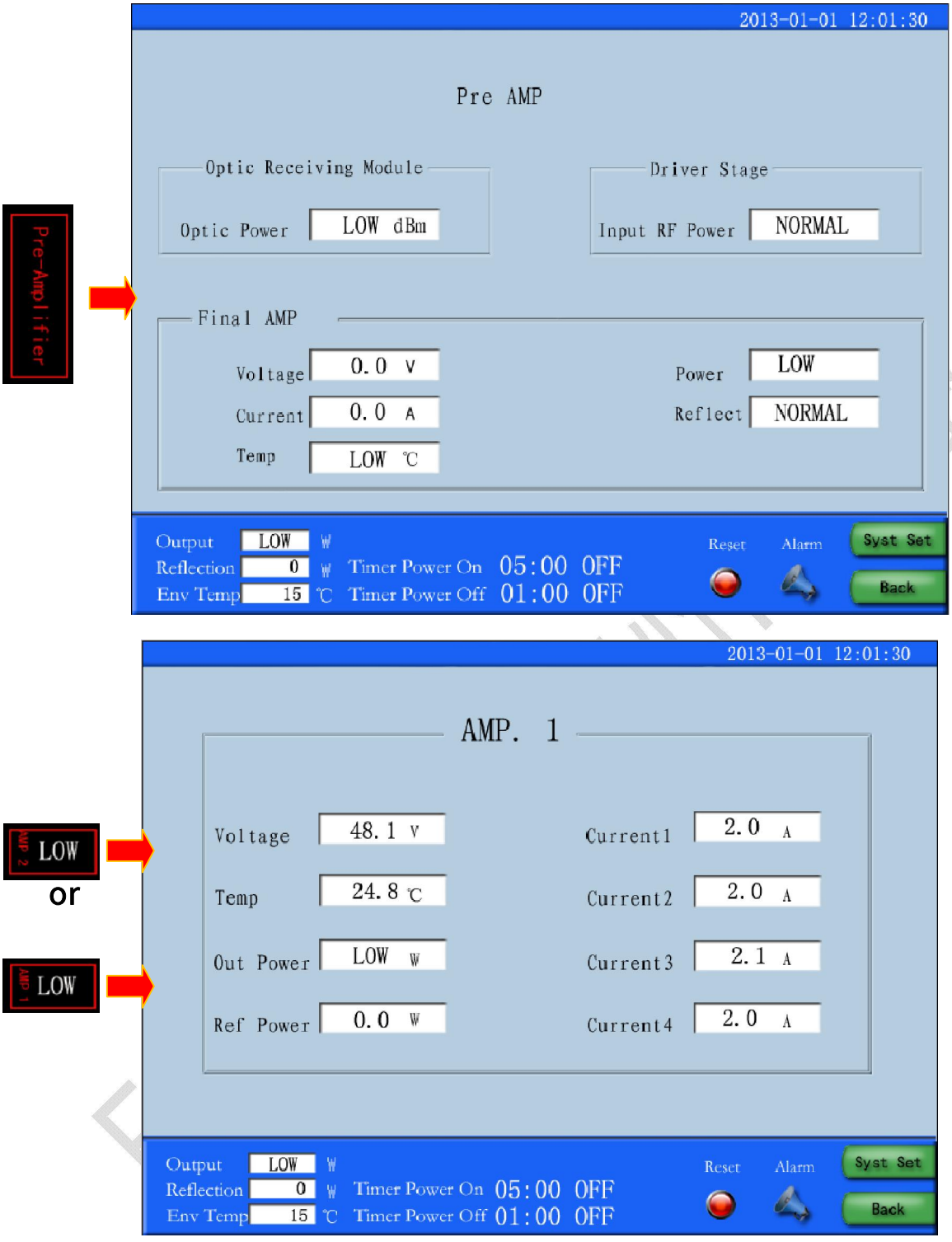
If an error happens on any constituent device of the transmitter, it will give alarm and its corresponding icon turns red to indicate errors.

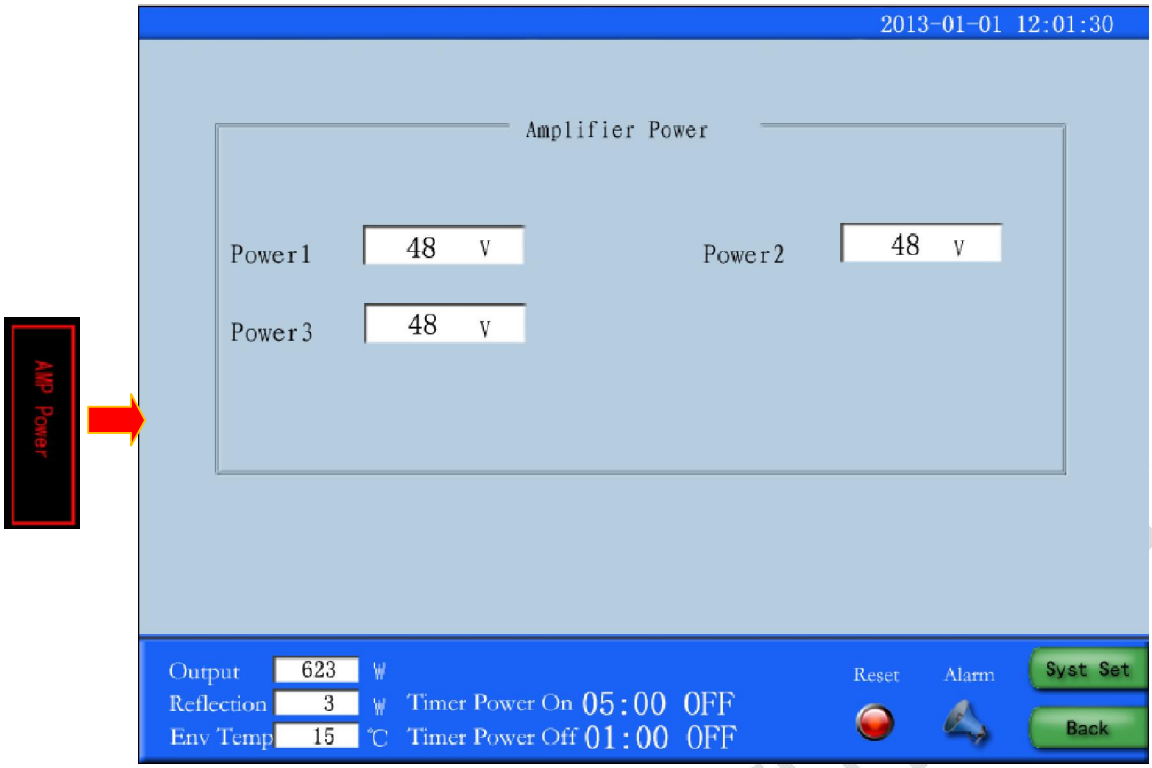
NOTE: Only Pre-Amplifier, AMP 1, AMP 2, ANT (antenna), or AMP Power will give alarm if any error happens on any one of them.



Alarm Interface

Touch the error device icon, and it goes to the sub-interface to display detailed parameters and show where problems lie.


Pre-Amplifier
2013-01-01 12:01:30
Pre AMP
Optic Receiving Module
Optic Power
LOW dBm
Driver Stage
Input RF Power
NORMAL
Final AMP
Voltage
0.0 V
Current
0.0 A
Temp
LOW ℃
Power
LOW
Reflect
NORMAL
Output
LOW
W
Reflection
0
W
Env Temp
15
℃
Timer Power On
05:00
OFF
Timer Power Off
01:00
OFF
Reset
Alarm
Syst Set
Back
LOW
or
LOW
2013-01-01 12:01:30
AMP. 1
Voltage
48.1 V
Temp
24.8 ℃
Out Power
LOW W
Ref Power
0.0 W
Current1
2.0 A
Current2
2.0 A
Current3
2.1 A
Current4
2.0 A
Output
LOW
W
Reflection
0
W
Env Temp
15
℃
Timer Power On
05:00
OFF
Timer Power Off
01:00
OFF
Reset
Alarm
Syst Set
Back

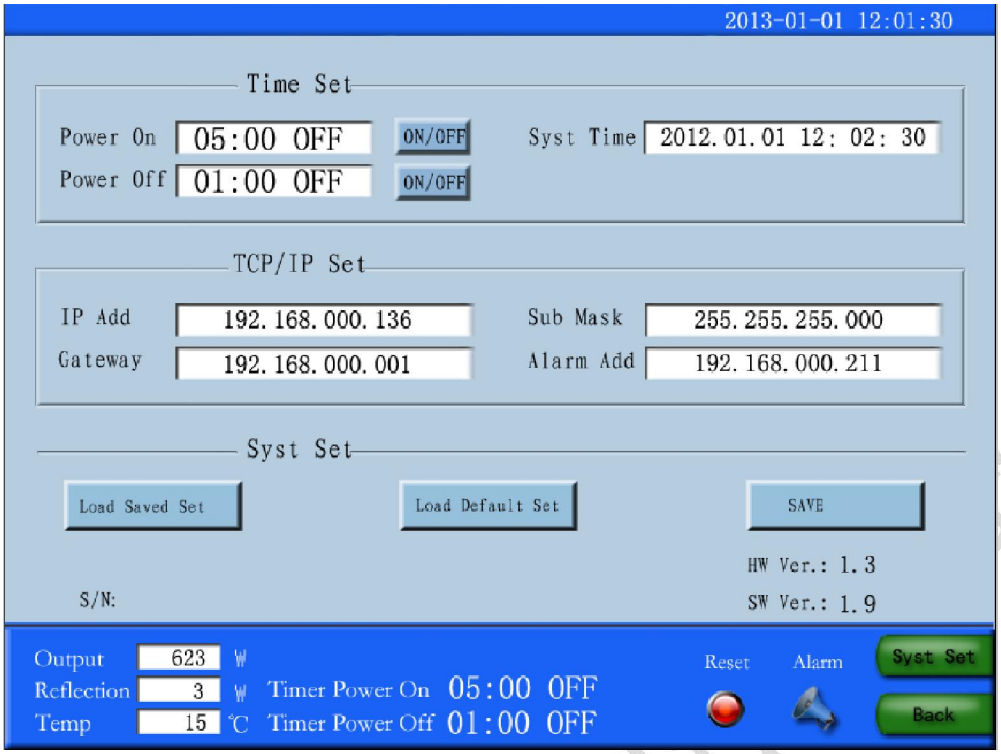


Introduction of Other Functions of Monitoring Unit

To reset the transmitter: For example, when the AMP power is cut off due to the amplifier's overload output power / over-high temperature / over-high reflect power. Press this button to reboot the AMP power after cleaning the trouble.

Touch this button to turn off the buzzer when the device gives alarm

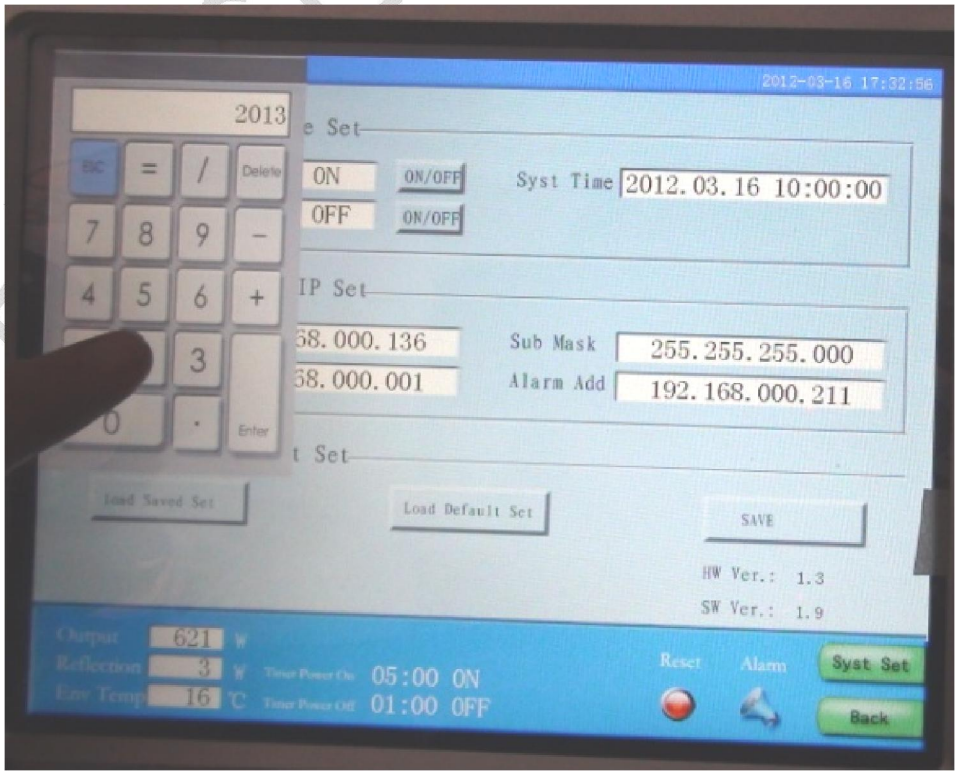
To set the system: press this button and it goes to interface as below:



Touch the item you are to modify and it pops out a soft key board for inputting new data. Press

to finish the setting and

to save the settings.



Chapter 5 Operation of AMP Power

There are 3 AMP Powers located at the bottom of the rack. They are used to offer power for the amplifier 1 & 2.

It is equipped with a LED screen on each power to display its current and voltage.

Alarm indicator

Press I/V button to shift the display of current and voltage on the LED screen.

Current

Voltage

Chapter 6 Services and Liability Assurance

6.1 Maintains Services

6.1.1 Contact our authorized maintains man or the local agent if you need technical services.

6.1.2 If you cannot contact our agent or distributor, please contact the headquarters in China and return the device if needed.

6.1.3 If you return any device for maintains, please attach an appendix to illustrate the breakdowns and necessary accessories. Please also provide the sender, contact number, address and etc to us.

6.2 Liability Assurance

6.2.1 We will charge if the device is not under warranty or the damage is caused by your improper operation.

6.2.2 Our company offers a one-year warranty to our direct customers. We will offer free maintains within 12 months counting from the delivery date due to the production problem or material factor.

6.2.3 The liabilities assured is limited our company or the designated agent, and we are in the position to test and identify the damage or fault is whether original or not.

6.2.4 If the terminal users modify the internal technical design (software upgrade) without permission, we will have no liability for any damage or fault caused there from even the device is still under warranty.